

## State Water Survey Division



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US EPA RECORDS CENTER REGION 5



491567

*Sauget Toxic*

**ENR**

Illinois Department of  
Energy and Natural Resources

September 22, 1982

Mr. Robert Mueller and  
Mr. Reed Neumann  
Attorney General's Office  
Environmental Control Division  
500 S. Second Street  
Springfield, IL 62701

Gentlemen:

The matter is the W. G. Krummrich Sanitary Landfill Site, often referred to as Sauget Toxic Dump Site. The analytical results available up to August 1982 for groundwater samples and samples of the seeps which enter the Mississippi River have been interpreted and analyzed.

The situation appears to be quite serious, in that a number of toxic, hazardous and Resource Conservation and Recovery Act pollutants are present in high concentrations. It is apparent that their release into the environment has occurred for some time and that this can be expected to continue unless effective remedial action is taken as soon as possible.\* It represents a very serious contamination source in the aquifer known as the American Bottoms and all caution and haste should be applied to its improvement.

Sauget Toxic Dump is shown in figure 1 with reference to the borings constructed by D'Appolonia Consulting Engineers in 1977. The figure shows the placement of 20 borings and 11 wells. A number of these wells represent nested pairs which are screened at depths between 86' and 60' for the deep set of wells, and in the shallow case, 56' and 33'. The earliest indications of problems were noted in Illinois EPA reports of January 1973, October 1975, and February 1976. These reports concern chemical analyses of well and groundwater samples in the vicinity of Crystallization and Spent caustic ponds in the northern portion of the site. The reports note high chemical oxygen demand (COD's) values which are non-specific indicators of organic contamination. The values ranged from 10 to 200 times the background levels previously observed in shallow groundwater systems in Illinois. Phenols were detected in numerous cases in well numbers 1-6 and in the Ranney well. Phenols are soluble toxic compounds which are not normally found in detectable quantities in uncontaminated groundwater.

In 1977, D'Appolonia Associates constructed the borings shown on figure 1. They noted in their well logs that evidence of leachate and organic odors were present at various depths in many of their borings. The depths of maximum leachate detection in soil borings are contoured in figure 2. They clearly show that in a number of borings from the central

\* Please note Appendix I.

*ACM*



portion and the northern portion of the site, leachate was detected to the maximum depth of well construction. When the remaining well log observations are contoured, it is clear that the deepest penetration of leachate occurred in a west-central location, fronting on the Mississippi River. The area between the riverbank gully west, northwest of well site number 15 and fronting on boring number 8, shown on figure 1, was clearly affected by seeps of odorous, organic leachate.

#### HYDROLOGIC GRADIENTS IN THE AREA

In 1979, Illinois EPA sampling and analytical observations showed very high total phenols concentrations in wells 9 (shallow & deep), 15 (shallow & deep), 17 (shallow), 19 (shallow), and 13 (deep). These were the results of colorimetric characterizations of the classes of organic compounds present in these samples. These concentrations are roughly 10 to 100 times above what would be expected in an uncontaminated groundwater system.

Two compounds, in particular, chlorotoluene and chlorophenol, were found in very high levels. The levels are sufficiently elevated so that their identification is unequivocal. There may be some problem, however, in interpreting the other analytical results, since the very high levels of chlorotoluene and chlorophenol may introduce significant interferences into the determination of minor organic components of this contaminated groundwater. Of note is the fact that both compounds, which are quite soluble in water, were identified in the secondary effluent of the Sauget wastewater treatment plant during 1980 by D. D. Ellis, et al. (Archives of Environmental Contamination and Toxicology, Volume 11, 1982, pages 373-382).

Repeat analysis of the monitoring wells on the toxic dump site in March 1981 disclosed that wells 1, 6, and 11, in addition to the previous wells, showed high levels of chlorinated organic contaminants. These levels observed were so high and the well locations were so far removed from each other that it is clear that general contamination of the area has occurred. It is most likely that contamination is limited to the landfill area proper.

Numerous deep samples taken from depths 65 to 81 feet below land surface showed high levels of organic contaminants. Four principal contaminants were found in this March 1981 sampling. Chlorophenol was found in all wells, but 17D; dichlorophenol, chloronitrobenzene were found in very high concentration in wells 9 (shallow) and 9 (deep), in close proximity to the area on the Mississippi River affected by the seeps. Dichlorobenzene was also found in high concentrations in wells closer to the riverbank. Number 9, for example, showed higher levels of contaminants in the surface than in the deep groundwater and these levels were higher than wells in the central portion of the site; examples are number 11 and number 17. In turn, these were higher than wells farther removed from the riverbank (see results for #19).

Again, large-scale contamination of the site is indicated by these three compounds: chlorophenol, dichlorophenol, and dichlorobenzene.



All of these industrial materials were observed from the surface to 80 feet, with a slight tendency for the shallow wells at the same location to be more contaminated.

In October of 1981, Illinois EPA staff from the Collinsville office, sampled seeps along the Mississippi River. The results have been reviewed in the memo of Milt Clark, Environmental & Human Health Specialist, USEPA Region V. In this document memo of April 29, 1982, to Sandra Gardebring of the USEPA legal staff, he noted the substantial coincidence of the major components of the seep and those materials identified as having been produced and disposed of at the site by Monsanto. I agree with the general tenor of his remarks. Most of the identified materials are highly toxic and have appreciable water solubility. In Table 2, I have outlined a number of these compounds, indicated their hazard rating, using a reference for the hazard rating of industrial chemicals. These compounds have been found in either the seeps and/or the groundwater at the Sauget Toxic Dump Site. The recent evidence from the seeps suggest that the concentrations of water soluble compounds are quite high. The soil on the riverbank in the region of the seeps is also highly contaminated with compounds, such as PCB's, which normally show very slight water solubility. The presence of high concentrations of water soluble compounds (phenols) has the effect of solubilizing and mobilizing other compounds which would normally not be expected to be mobile in aqueous systems. It should be noted that recent research (J. M. Davidson, et al., 1980) on pollutant mobility shows that the behavior of many toxic materials in contaminated soil/water systems is distinctly different from that predicted from previous studies done at low concentrations in pure systems. With the general direction of groundwater flow towards the river, it is clear that the Mississippi River has received continued discharge of polluted groundwater.

In effect, the soluble compounds act as early indicators of a much more serious, long-term environmental threat. The seeps are aqueous mixtures of chlorinated aromatic hydrocarbons, such as chlorobenzene, chlorinated phenols, chlorinated anilines, nitrobenzene derivatives, and various isomers and by-products of the production of the pesticide 2,4-D. Nearly all of the two-dozen or so compounds identified in the seeps at the site are above the maximum concentration levels reported to have no effect in mammals when administered on a chronic basis (USEPA, Water Quality Criteria Data Book, 1970). The latter group of compounds has been associated with the presence of dioxin (2,3,7,8-tetrachlorodibenzo-p-dioxin), which is among the most toxic substances known to man.

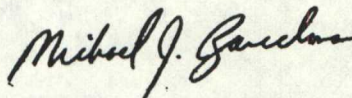
The Clark memo points out that this compound (dioxin) was confirmed in the seeps from USEPA and Monsanto results. The presence of these compounds in the mixture demands that ultimate precautions be observed in the study of this site. Between 23 and 27 individual compounds were identified by the IEPA in the three seep samples taken in October of 1981. Calculated total organic carbon levels in these samples are at least 5 to 10 times greater than those expected by comparison with other shallow groundwater environments in Illinois. Total organic carbon levels generally range from less than 0.1 milligrams per liter to 2 or 3 milligrams per liter in shallow groundwater systems in Illinois.



#### CONCLUSIONS

1. The situation is serious and has persisted for at least six years, judging from the early well records, hydrologic observations and the observation of leachate deep in soil borings at the site.
2. The affected area is large and subsurface contamination is evident in deep wells from various portions of the site.
3. The compounds involved in the groundwater contamination and subsequent seepage into the Mississippi River include extremely toxic soluble organic compounds which pose potentially serious risks to human health (Ref. - Table 1).
4. A large number of the compounds found in the seeps have been identified in the effluent of the Sauget Sewage Treatment Plant which receives a large portion of its waste from the W. G. Krummrich Plant. This is an example of the early appearance of more water soluble compounds in contaminant release. So long as the waste is in contact with percolating rainwater and groundwater, a continued situation for the release of more toxic compounds persists.
5. The hydrologic regime in the area strongly suggests that the landfill materials will continue to release toxic substances in the environment unless steps are taken to remove the wastes and to isolate them from groundwater resources.

Sincerely,



Michael J. Barcelona  
Head, Aquatic Chemistry Section  
217/333-2214

MJB/pcb

Attachments: 5

cc: Mr. Jim Gibb

Dr. T. G. Naymik

Mr. Perry Mann, IEPA ✓

Mr. Robert Kuykendall, IEPA